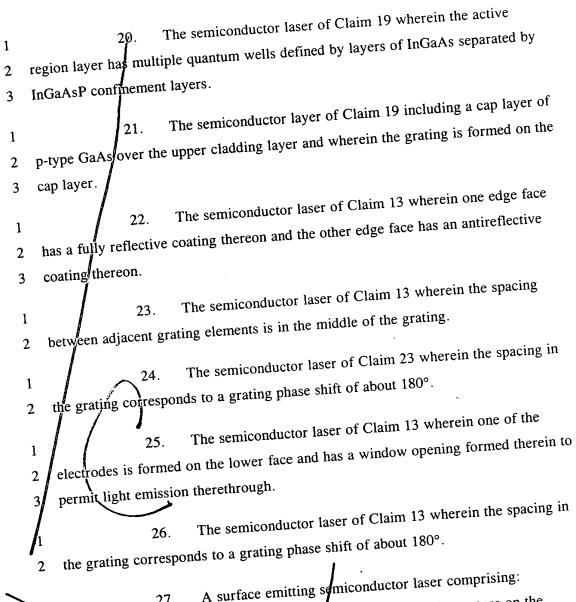
## CLAIMS

1. A surface emitting semiconductor laser comprising:  1. A surface emitting semiconductor laser comprising:  1. A surface emitting semiconductor laser comprising:  2. (a) a semiconductor substrate, an epitaxial structure on the  3. substrate including a layer with an active region at which light emission occurs,  4. upper and lower cladding layers surrounding the active region layer, upper and  5. lower faces, edge faces, one edge face having high reflectivity and one edge face  6. having low reflectivity, and electrodes by which voltage can be applied across the  7. epitaxial structure and the substrate; and  8. (b) a distributed feedback grating incorporated with the epitaxial  9. structure comprising periodically alternating grating elements to provide optical  10. feedback as a second order grating for a selected effective wavelength of light  11. generation from the active region, the grating having a selected phase shift with  12. respect to the high reflectivity edge face and positioned to act upon the light  13. generated in the active region to produce lasing action and emission of light from at  14. least one of the upper and lower faces of the semiconductor laser.  15. The semiconductor laser of Claim 1 wherein the grating is  16. The semiconductor laser of Claim 2 wherein the gold  17. The semiconductor laser of Claim 3 wherein the gold  18. The semiconductor laser of Claim 1 including means for  19. Confining the current from-the electrodes to a stripe region.
from the electrodes to a stripe region.
The semiconductor laser of Claim 1 wherein the 1.  6. The semiconductor laser of Claim 1 wherein the 1.  c and on the upper and lower faces of the semiconductor laser and the upper
2 fare formed on the GPF

tive stripe width in the active			
electrode is formed on a cap layer to define an active stripe width in the active			
Lik light ettilssion ood			
of Claim 1 wherein the active 5			
loviers and at least one and			
2 layer is formed of InGaAsP confinement layers, and the lower and upper			
layer is formed of InGaAsP confinement layers and the lower and upper well layer between the InGaAsP confinement layers, and the lower and upper well layer between the InGaAsP confinement layers, and the lower and upper layers are formed of n-type InGaP and p-type InGaP, respectively, and the			
d cladding layers are formed of n-type InGaP and p-type InGaP			
· c-mad of GaAS.			
learn loser of Claim 7 wherein the active 1981			
1 8. The semiconductor last 1 8. The semiconductor last 1 1 8. The semiconductor last 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
2 layer has multiple quantum wells defined by high			
- Enoment lavers.			
of Claim 7 including a cap lay			
1 9. The semiconductor layer of Claim 7 and 2 p-type GaAs over the upper cladding layer and wherein the grating is formed on the			
3 cap layer.			
3 cap layer.  10. The semiconductor laser of Claim 1 wherein one edge face			
c the reflective coating thereon and the other edge lace has			
, James N			
3 coating thereon.  11. The semiconductor laser of Claim 10 wherein the spacing			
1 11. The semiconductor laser of Change 11. The semiconductor laser of Change 11. The semiconductor laser of Change 11.			
respond to a grating phase shift value			
Claim 1 wherein one of the			
The semiconductor last 1			
The semiconductor laser of Claim 7 to 2  electrodes is formed on the lower face and has a window opening formed therein to 2			
: 1: -bt emission thereinfough.			
- hmiconductor laser comprising.			
/ <b>/ I M</b>			
substrate including a layer with an active region at white so substrate including a layer with an active region layer, upper and upper and lower cladding layers surrounding the active region layer, upper and			
4 upper and lower cladding layers surrous.			

lower faces, edge faces, and electrodes by which voltage can be applied across the 5 epitaxial structure and the substrate; and a distributed feedback grating incorporated with the epitaxial 6 structure comprising periodically alternating grating elements to provide optical feedback as a second order grating for a selected effective wavelength of light generation from the active region, the gharing having a spacing between adjacent grating elements at a position intermediate the edge faces that corresponds to a 10 selected phase shift in the grating, the grating formed and positioned to act upon the 11 light generated in the active region to produce lasing action and emission of light 12 from at least one of the upper and lower faces of the semiconductor laser. 13 The semiconductor laser of Claim 13 wherein the grating is 14 formed of alternating reflective elements and transmissive elements. 1 The semiconductor laser of Claim 14 wherein the reflective 2 15 1 grating elements are formed of gold. The semiconductor laser of Claim 15 wherein the gold 2 1 elements in the grating are separated by air. The semiconductor laser of Claim 13, including means for 2 17. confining the current from the electrodes to a stripe region. 1 The semiconductor laser of Claim 13, wherein the electrodes 2 are formed on the upper and lower faces of the semiconductor laser and the upper 1 electrode is formed on a cap layer to define an active stripe width in the active 2 3 region layer at which light emission occurs. The semiconductor laser of Claim 13 wherein the active 4 region layer is formed of InGaAsP confinement layers and at least one InGaAs 1 quantum well layer between the InGaAsP confinement layers, and the lower and 2 upper cladding layers are formed of n-type InGaP and p-type InGaP, respectively, 3 4 and the substrate is formed of GaAs. 5

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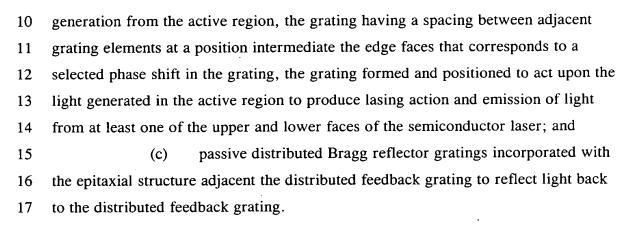


A surface emitting semiconductor laser comprising: 27.

a semiconductor substrate, an epitaxial structure on the substrate including a layer with an active region at which light emission occurs, upper and lower cladding layers surrounding the active region layer, upper and lower faces, edge faces, and electrodes by which voltage can be applied across the epitaxial structure and the substrate;

a distributed/feedback grating incorporated with the epitaxial 6 structure comprising periodically/alternating grating elements to provide optical 7 feedback as a second order grating for a selected effective wavelength of light 8 9

4 5



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28. The semiconductor laser of Claim 27 wherein the distributed feedback grating is formed of alternating reflective elements and transmissive

elements.

The semiconductor laser of Claim 28 wherein the reflective

2 grating elements are formed of gold.

1 30. The semiconductor laser of Claim 29 wherein the gold 2 elements in the grating are separated by air.

7 31. The semiconductor laser of Claim 27 including means for confining the current from the electrodes to a stripe region.

2 3

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32. The semiconductor laser of Claim 27 wherein the electrodes are formed on the upper and lower faces of the semiconductor laser and with the upper electrode is formed on a cap layer to define an active stripe width over the active region layer at which light emission occurs.

The semiconductor laser of Claim 32 wherein the active

region layer is formed of InGaAsP confinement layers and at least one InGaAs

quantum well layer, between the InGaAsP confinement layers, and the lower and

4 upper cladding layers are formed of n-type InGaP and p-type InGaP, respectively,

5 and the substrate is formed of GaAs.

1	34.	The semiconductor laser of Claim 32 wherein the active	
2	region layer has multiple quantum wells defined by layers of InGaAs separated by		
3	InGaAsP confinement layers.		
_	- 1		
1	35.	The semiconductor layer of Claim 32 including a cap layer of	
2	P-type GaAs over the	e upper cladding layer and wherein the grating is formed into	
3	the cap layer.		
1	36.	The semiconductor laser of Claim 27 wherein both edge faces	
2	are formed to be antireflective.		
1	37.	The semiconductor laser of Claim 27 wherein the spacing is	
2	in the middle of the grating.		
1	38.	The semiconductor laser of Claim 37 wherein the spacing in	
2	the grating corresponds to a grating phase shift of about 180°.		
		COL: 27 wherein the distributed	
ļ	39.	The semiconductor laser of Claim 27 wherein the distributed	
2	Bragg reflector grati	ings are first order gratings.	
1	40.	The semiconductor laser of Claim 27 wherein the distributed	
2	Bragg reflector gratings are second order gratings.		
1	41.	The semiconductor laser of Claim 27 including an insulating	
2	layer over the distri	buted Bragg reflector gratings to inhibit current flow through	
3	these gratings.		
1	42.	The semiconductor laser of Claim 27 wherein one of the	
1	,	on the lower face and has a window opening formed therein to	
2	Programme and the second secon		
3	permit fight emission	n mereunough.	
1	43.	The semiconductor laser of Claim 27 wherein the spacing in	
2	the grating correspo	onds to a grating phase shift of about 180°.	